Blood-Based Biomarker Solutions for Cancer Therapy-Associated Neurotoxicities

Cancer therapy-associated neurotoxicities can exert debilitating effects on patients and negatively impact the course of cancer treatment. There is a critical need for accurate biomarker tests that could predict the onset as well as assess the severity of neurotoxicities. In addition, such tests could potentially provide real-time feedback to clinicians during treatment to proactively adjust or fine-tune cancer therapy regimen and for supportive care for patients who experience acute or long-term toxicities. Recent data from a number of clinical studies have shown that blood-based Simoa® biomarker assays (NfL, etc.) are promising as **predictive** and **quantitative** biomarkers for cancer therapy-associated neurotoxicities.
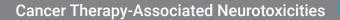
This Publication Brief summarizes published studies in two key areas: (1) chemo-induced neurotoxicities, both for peripheral neuropathy (CIPN) and CNS neurotoxicity; (2) neurotoxicities associated with other cancer therapies such as CAR T-cell therapy, immunotherapy and targeted therapy. We look forward to adding new publications in this critically important area.

Focus	Article	Authors	Journal
Chemo-Induced Neurotoxicities, Peripheral Neuropathy (CIPN) and CNS Neurotoxicty			
Melanoma, Sarcoma, Merkel cell carcinoma	A prospective feasibility trial exploring novel biomarkers for neurotoxicity after isolated limb perfusion	A. Corderfelt Keiller et al.	Perfusion. 2023
Preclinical (mouse)	Plasma neurofilament light chain as a potential biomarker of neurodegeneration in murine brain	T. Sano et al.	Toxicology Research. 2023
Breast cancer	Studies to assess the utility of serum neurofilament light chain as a biomarker in chemotherapy-induced peripheral neuropathy	G. Cavaletti et al.	Cancers. 2023
Ovarian cancer	Neurofilament light chain as a biomarker of axonal damage in sensory neurons and paclitaxel-induced peripheral neuropathy in patients with ovarian cancer	C. Mortensen et al.	Pain. 2023
Breast cancer	Serum neurofilament levels correlate with electrodiagnostic evidence of axonal loss in paclitaxel-induced peripheral neurotoxicity	R. Velasco et al.	Journal of Neurology. 2023
NSCLC	Neurofilament light as a predictive biomarker of unresolved chemotherapy-induced peripheral neuropathy in subjects receiving paclitaxel and carboplatin	B. Burgess et al.	Scientific Reports. 2022
Breast cancer	Prospectively assessing serum neurofilament light chain levels as a biomarker of paclitaxel-induced peripheral neurotoxicity in breast cancer patients	S. Karteri et al.	Journal of the Peripheral Nervous System. 2022

Focus	Article	Authors	Journal
Breast cancer	Serum neurofilament light chain levels as biomarker of paclitaxel-induced cognitive impairment in patients with breast cancer: a prospective study	A. Argyriou et al.	Supportive Care in Cancer. 2022
Preclinical (rodent)	Blood neurofilament light chain as a potential biomarker for central and peripheral nervous toxicity in rats	T. Sano et al.	Toxicological Sciences. 2021
Preclinical (rodent)	Pharmacological SARM1 inhibition protects axon structure and function in paclitaxel-induced peripheral neuropathy	T. Bosanac et al.	Brain. 2021
Breast cancer	Neuroinflammation and its association with cognition, neuronal markers and peripheral Inflammation after chemotherapy for breast cancer	G. Schroyen et al.	Cancers. 2021
Preclinical (rodent)	Assessment of neurofilament light protein as a serum biomarker in rodent models of toxic-induced peripheral neuropathy	G. Fumagalli et al.	Neuromethods (vol. 172). 2021
Preclinical (rodent)	Neurofilament light chain: a specific serum biomarker of axonal damage severity in rat models of chemotherapy-induced peripheral neurotoxicity	C. Meregalli et al.	Archives of Toxicology. 2020
Colorectal cancer	Serum neurofilament light chain levels as a biomarker of neuroaxonal injury and severity of oxaliplatin-induced peripheral neuropathy	S.H. Kim et al.	Scientific Reports. 2020
Preclinical (rodent)	Neurofilament light chain as disease biomarker in a rodent model of chemotherapy induced peripheral neuropathy	C. Meregallia et al.	Experimental Neurology. 2018
Other Cancer Therapy-Associated Neurotoxicities			
Imunotherapy	Concentrations of S100B and neurofilament light chain in blood as biomarkers for checkpoint inhibitor−induced CNS inflammation	S. Bjursten et al.	EBioMedicine. 2024
Targeted therapy	Neurofilaments as serum biomarkers of brentuximabvedotin-induced peripheral neurotoxicity in CD30+ lymphoma patients: A prospective single-center study	E. Domingo Domenech et al.	Blood. 2023
CAR T-cell therapy	Assessment of pretreatment and posttreatment evolution of neurofilament light chain levels in patients who develop immune effector cell−associated neurotoxicity syndrome	O. Butt et al.	JAMA Oncology. 2022
CAR T-cell therapy	Neurofilament light chain serum levels correlate with the severity of neurotoxicity after CAR T-cell treatment	F. Schoeberl et al.	Blood Advances. 2022
Drug-Induced Peripheral Neuropathy (Non-Cancer)			
Spinal Muscular Atrophy, Huntington's disease (preclinical)	Neurofilament light chain: A translational safety biomarker for drug-induced peripheral neurotoxicity	D. Theil et al.	Toxicologic Pathology. 2023